**Accurate quantification of sediment conveyance following the 2016 Kaikōura earthquake, New Zealand**

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# ABSTRACT

Following the 2016 MW7.8 Kaikōura earthquake in New Zealand, the volume of post-seismic erosion was quantified directly by measuring the ground surface change between 4 lidar surveys captured in 2016, 2017, 2019 and 2021 using the multiscale model-to-model cloud comparison (M3C2) algorithm. The lidar surveys covered the 62 km2 Hapuku and 66 km2 Kowhai river catchments within the Seaward Kaikōura Range, representing the two catchments with the highest density of co-seismic landsliding.

In the 5 years after the earthquake a total of 10.60 ± 0.22 M m3 of sediment was post-seismically eroded (equivalent to ~26% of the co-seismic landslide debris volume when considering bulking of the landslide deposit). The majority of the sediment (9.76 ± 0.14 M m3) was eroded from the 17 M m3 rock avalanche which dammed the Hapuku river. A total of 9.71 ± 0.23 M m3 of sediment was delivered to the riverbed resulting in considerable riverbed aggradation and 3.58 ± 0.28 M m3 was inferred to have been transported beyond the range front of the Seaward Kaikōura Range (equivalent to ~9% of the co-seismic landslide debris).

In contrast, only 2.02 ± 0.10 M m3 of sediment was post-seismically eroded in the Kowhai Catchment, with 1.29 ± 0.10 M m3 delivered to the riverbed. The volume of eroded sediment is equal to ~13% of the co-seismic landslide debris volume within the catchment. Only 0.85 ± 0.13 M m3 of sediment is presumed to have been transported beyond the range front (equivalent to ~5% of the co-seismic landslide debris) over the 5 years.